Space Weather Forecast

Issued on Thursday, 16 February 2023 at 13:29 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: R1/R2 Radio Blackouts likely. G1-G2 Minor/Moderate Storms likely, mainly day 2 (17th), due to CME (coronal mass ejection) arrival.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate, with two low-level Moderate class flares. One of these way from a sunspot that has rotated off the Earth-facing Sun, but with its magnetic looping still visible over the northwest horizon. The other is from a new region rotating onto the disc from the other direction, over the northeast horizon. The large sunspot in the centre northern disc does have a small amount of complexity with a reverse magnetic polarity region amongst its more broken up group of spots, but otherwise is relatively stable with a fairly simple bipolar magnetic structure. Including the new region rotating onto the disc, there are six visible sunspot regions, however all other regions are magnetically simple. Two filament eruptions occurred, which where the Sun releases a line of plasma that has been held together above its surface by its magnetic field. The CMEs that these produced has yet to be analysed for any Earth-directed component.

Solar Wind / Geomagnetic Activity: The observed solar wind showed a transition from the tail end of a recent CME (which arrived on the 14th) into a fast wind environment, likely from an obscured coronal hole in the northern solar hemisphere. The observed speed was initially at around 300-330 km/s, but started erratically rising from around midnight, to reach slightly elevated levels of 440-470 km/s by midday. The magnetic field was initially Moderate with a negative (southward) north-south component before rotating to positive after around 15/2100 UTC. The total magnetic field strength then increased after midnight to become strong. The north-south component showed three distinct rotations between positive (northward) and negative (values) values, but with strong southward peaks. Geomagnetic activity has been Unsettled to Active, with one G1/Minor Storm interval between 16/0600-0900 UTC (Kp 3-5).

Energetic Particles / Solar Radiation: The count rate of energetic particles was at background levels with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate to Low activity expected with further Moderate class flares likely. These could occur from the large sunspot in the centre disc, but potentially also from the two now over the northwest horizon, and the new region rotating onto the visible disc.

Solar Wind / Geomagnetic Activity: A filament eruption CME, which left just east of the centre-southern disc on the 15th is forecast to arrive during the second half of day 2 (17th). Otherwise current fast winds are expected to continue day 1 (16th), perhaps briefly easing before the CME arrival day 2 (17th). Ongoing CME influence is then expected day 3 (18th) before solar winds ease by day 4 (19th). Unsettled to Active geomagnetic activity day 1 (16th) and early day 2 (17th) with an ongoing likelihood of G1/Minor Storms. CME arrival day 2 is then expected to bring Active to G1/Minor Storms and a chance of G2/Moderate storms. These easing day 3 (18th) but still a chance of isolated G1/Minor Storms). Becoming mainly Quiet, with isolated Unsettled spells day 4 (19th).

Energetic Particles / Solar Radiation: The count rate of energetic particles is expected to

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remain at background levels. There is a slight chance of count rates exceeding the S1/Minor radiation storm level in response to any significant flares that occur.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	50	60	30	5
Strong	G3	No	1	10	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	55	50	40	40
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	5	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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